SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
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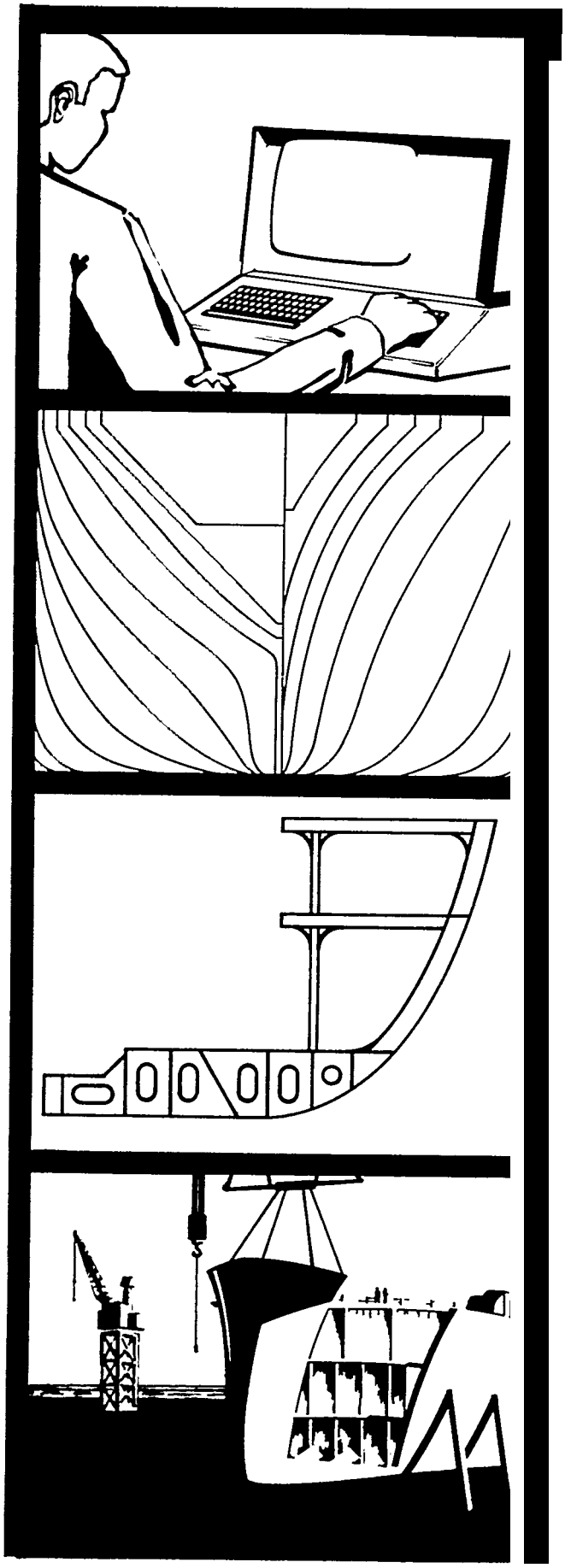

R ESEARCH
AND
E NGINEERING
FOR
A UTOMATION
AND
P RODUCTIVITY
IN
S HIPBUILDING

Proceedings of the REAPS Technical Symposium

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THE SPADES SHIP PRODUCTION AND CONTROL (SPAC) MODULE

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Cali and Associates, Inc.
Metairie, Louisiana

Since the founding of Cali and Associates, Mr. Cali has directed the continuous development of the SPADES system and expanded the company to provide complete N/C lofting services to the shipbuilding industry. He has 30 years of experience in all phases of shipbuilding.

Mr. Cali has a degree in engineering ’from the Italian Naval Academy.

GENERAL COMMENTS AND INTRODUCTION

The purpose of this writing is to report the present status of development and implementation of the 'SPAC' Module.

The 'SPAC' Module was originally conceived two years ago, and the justification for its development is just as valid today as it was then. Actually, our increasing experience in operating a service center for N/C Lofting has provided additional reasons for generating other computer outputs not conceived originally to reduce lofting man-hours and better control shedules, as shown later.

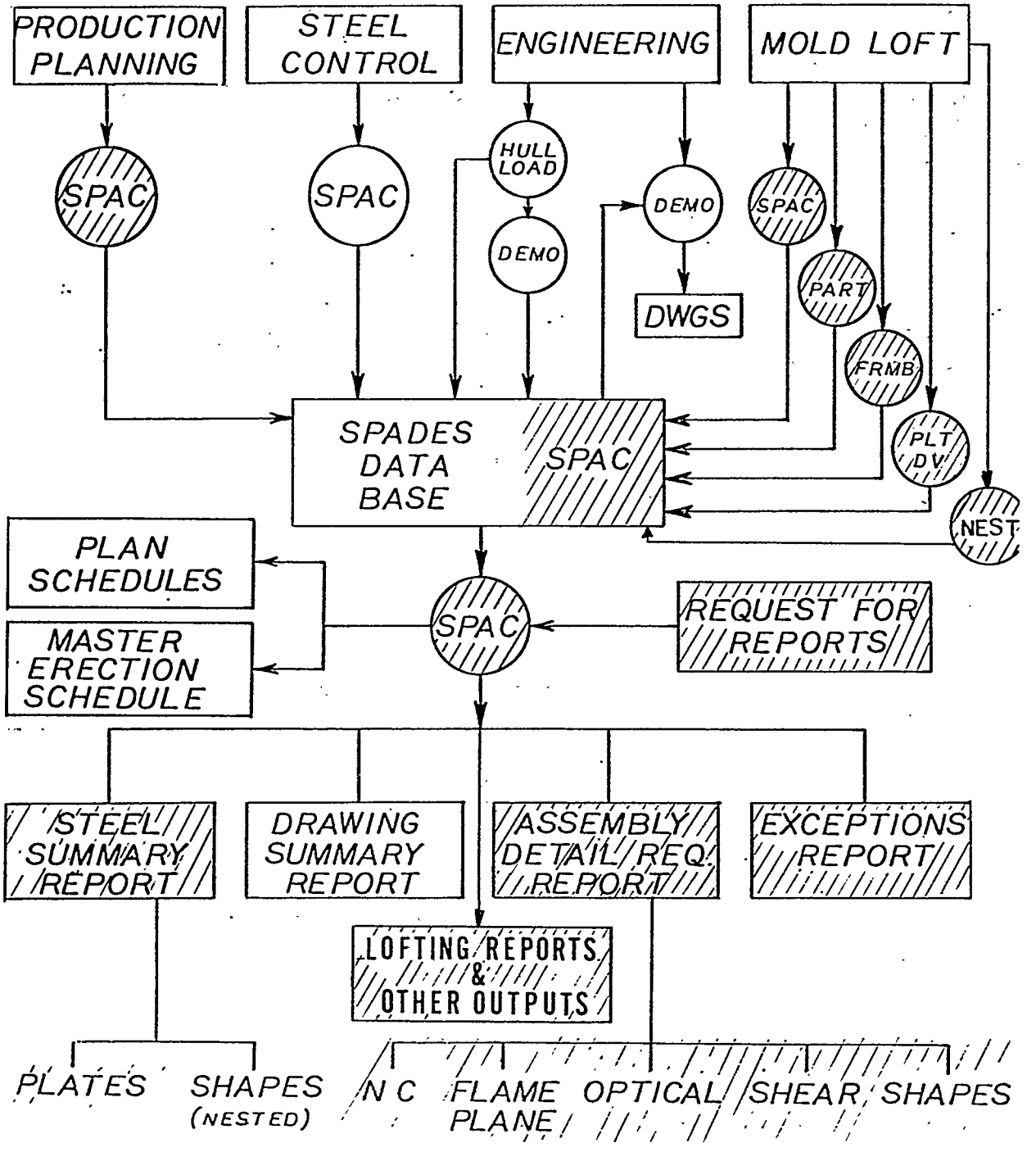
It should be mentioned at this point that the labeling capabilities added to the 'SPADES' System in general because of the 'SPAC' Module will make it desirable to upgrade the hardware used in the loft and in the shop. A fast drafting machine should be used in those shops with a high work load, and a 'DNC' mode of operation will allow not to punch a high volume of paper tape.

Provisions have also been made for transferring all applicable labeling and lofting markings to the burning machine. To do so today for all tapes will probably overload the burning machine. I feel that the use of this feature is justifiable at the present only when using the burning machine for cutting templates from light gauge sheet metal or aluminum, since this operation will represent only a small percentage of the total work load. Total use of it will probably have to wait until better marking systems are available, although some shipyards with surplus N/C cutting capability might find it desirable, even with today's hardware. The zinc oxide marker is probably the best tool to use at the present for this purpose

SPADES SYSTEM

Figure 1

DATA FLOW FOR SHIP PRODUCTION AND CONTROL MODULE



STATUS REPORT

Figure 1 is a copy of the 'data flow' conceived for 'SPAC' originally; and since no major changes have occurred during the 'development, it is used to report on the present status.

The status as reported herein is not in terms of coding done yet to be tested. The shaded areas represent the actual extent of 'SPAC' as presently in production use by our N/C Lofting Department.

Implementation was started last October, and the various examples shown later are working documents for a notch tug we are in process of lofting for Atlantic Marine, Inc., in Jacksonville, Florida.

The detail status report is as follows:

A. Data Base

Expansion of the data base to accommodate all records requirements for 'SPAC' has been completed. Proper provisions have also been made for all other ship systems other than steel, such as: piping, HVAC, outfitting, etc. It is expected that some new handling routines will become necessary as the development continues.

B. 'SPAC' Program

At the present,. this program allows the loft and production planning to communicate with the data base for initial loading of assembly (unit) breakdown; to assign schedules and personel and enter data.. such as validation of individual items. It is also used to request all reports except those generated automatically by the system when applicable.

As the experience in the use of 'SPAC' increases, it is inevitable that changes and additions will be incorporated.

C. 'PARTGEN', Framebending, Plate Development and Nesting

The necessary modifications in these modules to integrate with 'SPAC' have been completed and no further changes for this purpose are expected.

I am pleased to report that the additional input requirements in these modules is very minimal and very simple. Furthermore, it has been structured in such a way, not to require any modification of past input.

D . 'S P A C' R e p o r t s

All reports shown shaded in Figure 1 are complete and available to the user. I am sure that format changes and added information will be requested by the 'SPADES' users other than ourselves to better suit the practices of the various shipyards. Under the guidance and with the approval of the 'SPADES' Users' Steering Committee, we will incorporate such changes,

E. Lofting Reports and Other Outputs

These reports have been added during the development to aid the loft in tracking the work in progress, and to minimize clerical errors of identification, such as mislabeling a part, or showing the thickness throw on the wrong side of the molded line. The lat - ter will prove very valuable in reducing man-hours and turn around time associated with design and production changes, or with rework due to errors.

F. On-Going Development

The various records presently stored in the data base contain more information than is utilized by the various 'reports. One good example is the three-dimensional center of gravity associated with each piece. High on the list of priorities is the generation of the weight and center of gravity by assembly and for the entire ship.

Within the practical space limitations of this paper, it would be difficult to include a full, complete 'SPAC' report for an entire module. For a better understanding, Pages 7 through 40 have been, collected to give the interested reader a quick walk through the lofting process and its tie-in with the 'SPAC' Module.

Frame Bending Module

Page 7 is part of a drawing showing a shell longitudinal (L- 12) terminating at Fr. 54. The longitudinal belongs to Module 1 and is contained in Drawing 777. The Pc. Mk. is l-777LI20540P. Page 8 shows the input coding (from Longitudinal L-7 to L-12). Pages 9 and 10 are the

end-cut templates at the forward end of the beam. Page 11 is a tabulation of the developed curvature to enable the making of a full stale template. Page 12 is a typical summary printed for ,. each beam.

Page 13 (Line 61) is a page of the 'SPAC' Report for Module 1, showing all data needed and templates to be used to fabricate and bend the longitudinal in the shop.

Plate (Shell) Development Module

Page 14 is portion of the shell expansion drawing (777) showing Shell Plate C -2. The Pc. Mk. is 1-.777C 2: S. Page 15 is the input for this plate and three other plates. The same input is used for the roll sets. Page 16 is the plot of the developed part. Page 17 shows the corresponding roll sets. Page 18 is part of the nested tape to cut the roll sets from surplus material. Pages 19 and 20 are the title block and plot location of the templates within the nested Tape No. -741011, Rev. 2. The digit '4' in this number indicates that these are templates and not parts. Page 21 (Line 21) lists tape and template needed to cut and roll the plate. Page 22 (Line 55) shows that Template 8023-401 is nested within Tape No. 741011 and is to be used for Pc. Mk. 777. C 2 S.

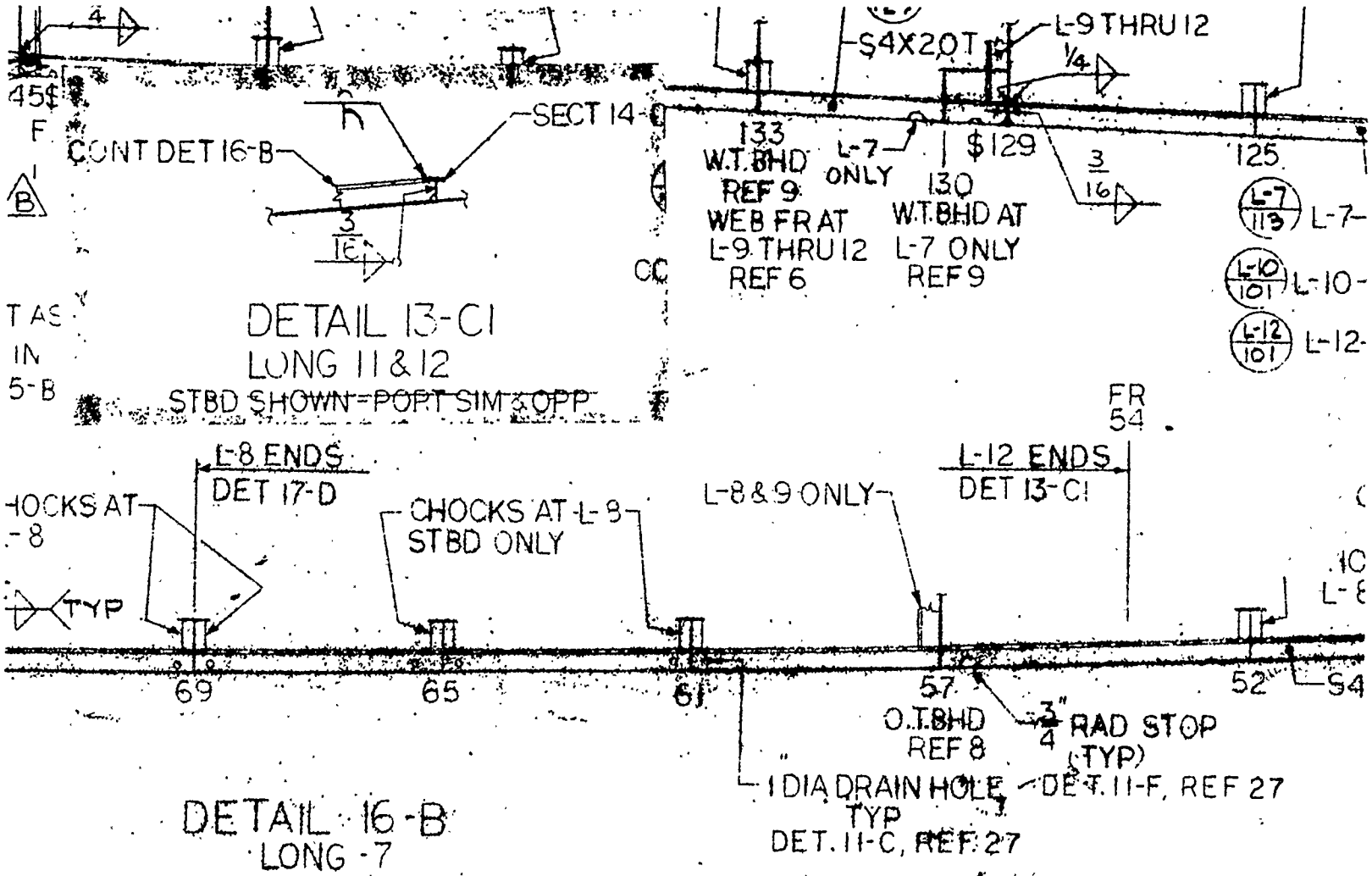
Part Generation Module

Page 23 (Dwg. 786) shows a transverse bulkhead (Pc. 174) and associated vertical stiffness within Module 2.07. The bulkhead Pc. Mk. is 2. 0.7-786085017.4C. The stiffener shown (172) has Pc. Mk. 1-78.61720850 S. Page 24 is the input coding. Page 25 is the tabulation of the part geometry. Page 26 is the plot of the part (Note the thk. throw from the molded line plotted by the drafting machine). Page. 27 is the input for all stiffeners on the bulkhead. The four lines for 2.0.7-7861720850 S are bracketed. Pages 28 to 31 are the end-cut templates. Page 32 (Line 20) shows cut length, other data and template associated with the stiffener.

Nesting Module

Page 33 is the input for Nest Tape No. 710039 calling for the above bulkhead. Pages 34, 35 and 36 are title block, plot location of parts, and summmary report for the tape. On Page 35, the bulkhead, (Pc. Mk. 2. 07-786850174 C) is Item No. 9. Page 37 (part of the plot of the tape) shows the piece marked <9>. Page 38 is the proof drawing we deliver with each tape.

Page 39 lists the plates and tapes needed for Module 2.07, and Page 40 shows the tape number to be used to cut the bulkhead.


4
45$
F
CONT DET 16-B
SECT 14-C
3/16
CC
T AS
IN
5-B
DETAIL 13-C1
LONG 11 & 12
STBD SHOWN = PORT SIM & OPP
S4X20T
L-9 THRU 12
1/4
133
W.T.BHD
REF 9
WEB FR AT
L-9 THRU 12
REF 6
L-7
ONLY
$129
130
W.T.BHD AT
L-7 ONLY
REF 9
3/16
125
L-7/113 L-7-
L-10/101 L-10-
L-12/101 L-12-
FR
54
L-8 ENDS
DET 17-D
L-12 ENDS
DET 13-C1
CHOCKS AT
-8
TYP
CHOCKS AT L-9
STBD ONLY
L-8 & 9 ONLY
69
65
61
57
52
S4
O.T.BHD
REF 8
3/4" RAD STOP
(TYP)
1" DIA DRAIN HOLE
TYP
DET. 11-C, REF 27
DET. 11-F, REF 27
DETAIL 16-B
LONG -7
STBD SHOWN - PORT SIM & OPP EXCEPT AS NOTED
LONG-8 THRU 12 SIM EXCEPT AS SHOWN IN DET 13-B, 13-C1 & 17-D
DETS NOT SHOWN SIM DET 15-A
CHOCKS AT
L-13 ONLY
(TYP)

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

INPUT EXECUTE          DATE  05/29/78    TIME  22/24/58      RUN NO.     5
JOB P801  PROG. MAID  FRED          INPUT 0032    REV. NO.    4          PAGE    1

INPS                    N       32                                          7800320004
RMKS  JESSE                                                                 7800320008
MODL    1                                                                   7800320012
DRWG 777      16-B                                                          7800320016
LONG                     M          S L7       S L12                       7800320120
NADT  S4X2.0T           N      904                                          7800320124
PCMK 777L 70470 P       S L7                                               7800320128
     777L 80470 P       S L8                                               7800320132
     777L 90470 P       S L9                                               7800320136
     777L100470 P       S L10                                              7800320140
     777L110470 P       S L11                                              7800320144
     777L120540 P       S L12                                              7800320148
BUTT                    F 47     Z1     .324  F 73.    2       2 0         7800320152
ECUT                    A*       S       1 8 A*         S       1 8         7800320156
OPTN FLG1FLG2TABL                                                           7800320176
MARK ALL                                                                    7800320180
DEFN                    S L8                                                7800320252
BUTT                    F 47.    Z1     .324  F 69.                        7800320256
DEFN                    S L9                                                7800320257
BUTT                    F 47.    Z1     .324  F 73.    2       2 0         7800320259
DEFN                    S L12                                               7800320260
BUTT                    F 54     Z1     .188  F 73.    2       2 0         7800320264
ECUT                    A*       S       1 8 A*         S       1 8         7800320268
OPTN FLG1FLG2TABL       I    1.406                                          7800320272
INPE                                                                        7800329999
        1         2         3         4         5         6         7         8
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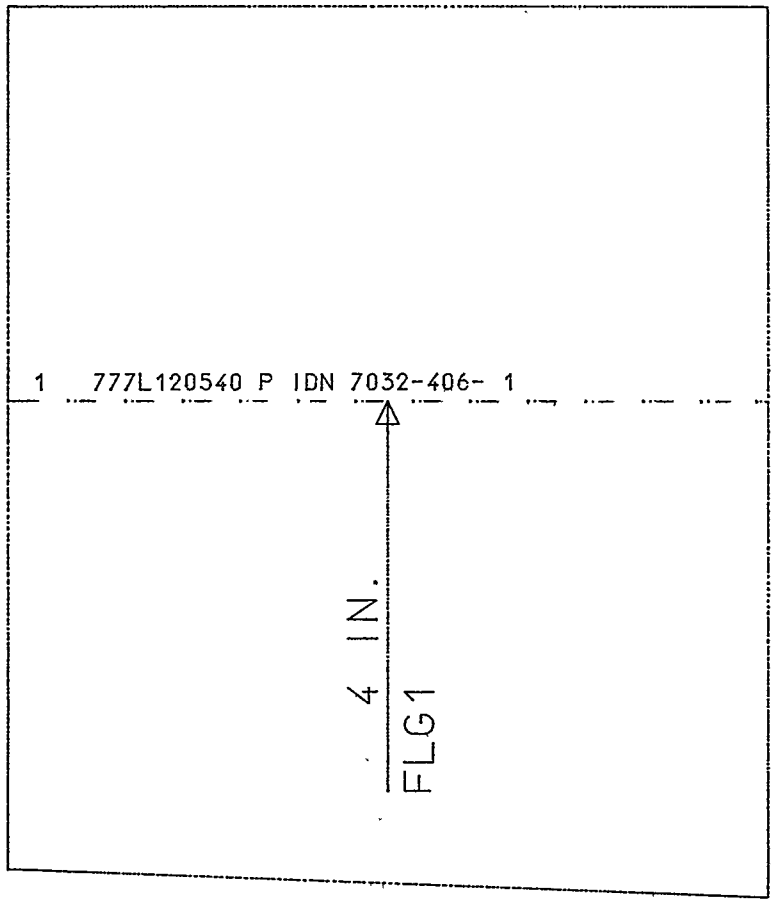


TAPE NO. 787032-406- 1

TAPE NO. 784032-406- 1

PIECE IDN. 6052-400 REV. 1 (FRAME FEND. TABLE) PCMF. 1 777L120540 P DWG. 777 16-6

S 4X2.0 T AL5086 LONG FRAME S L12 P OF SHIP'S SURFACE F F

TABLE OF OFFSETS

DISTANCE (Y) OF THE TRACE FROM THE CHORD AT LOCATION (X) IN FT-IN-16

MARK		R FWD			F 57.000				F 59.050	
X	0- 0- 0	0- 3- 7	1- 0- 0	2- 0- 0	3- 0- 4	3- 0- 1	4- 0- 0	5- 0- 0	5- 0- 4	6- 0- 0
Y	0- 0- 0	- 0- 0- 1	- 0- 0- 3	- 0- 0- 5	- 0- 0- 8	- 0- 0- 8	- 0- 0-10	- 0- 0-12	- 0- 0-12	- 0- 0-13

MARK	F 61.000			F 63.050			F 65.000		
X	7- 0- 0	7- 0- 7	8- 0- 0	9- 0- 0	9- 0-10	10- 0- 0	11- 0- 0	11- 0-13	12- 0- 0	13- 0- 0
Y	- 0- 0-14	- 0- 0-14	- 0- 0-15	- 0- 1- 0	- 0- 1- 0	- 0- 1- 1	- 0- 1- 1	- 0- 1- 1	- 0- 1- 0	- 0- 1- 0

MARK	F 67.000			F 69.000			F 71.050			F 72.100	R AFT
X	13- 0-15	14- 0- 0	15- 0- 0	15- 1- 2	16- 0- 0	17- 0- 0	17- 1- 4	18- 0- 0	18- 7- 6	18-11- 7
Y	- 0- 1- 0	- 0- 0-14	- 0- 0-13	- 0- 0-13	- 0- 0-11	- 0- 0- 8	- 0- 0- 8	- 0- 0- 5	- 0- 0- 3	- 0- 0- 1

MARK	F 73.000		
X	19- 0- 0	19- 1- 6	19- 3- 7
Y	- 0- 0- 1	- 0- 0- 1	0- 0- 0

DATE 06/07/78
YARD JOB NO. 7005PB01
D.B. NAME PB01
D.B. JOB NO. 7

S P A D E S S Y S T E M

PRODUCTION AIDS MODULE-FRAME BENDING PROGRAM

INDIVIDUAL BEAM SUMMARY REPORT

PIECE NO. 401 WITHIN INPUT DECK NO. 102 - RUN NO. 4

3.08/78 41500 P INSV FRAME F 150000P ON SHIP'S SURFACE L 64A P

PHYSICAL PROPERTIES:

SIZE	S 6X3.0 T AL5086
NEUTRAL AXIS	4.356 INCHES
DEPTH OF WEB	6.000 INCHES

INPUT DEFINITION OF BUTTS AND END-CUTS :

BUTT		FORG	X	-15 0	PEND	X	-5 0
ECUT	SQCISQCTSQCI	A	15	1 8			

MINIMUM CUT-LENGTH REQUIRED : 2/ 0/11 FT/IN/16

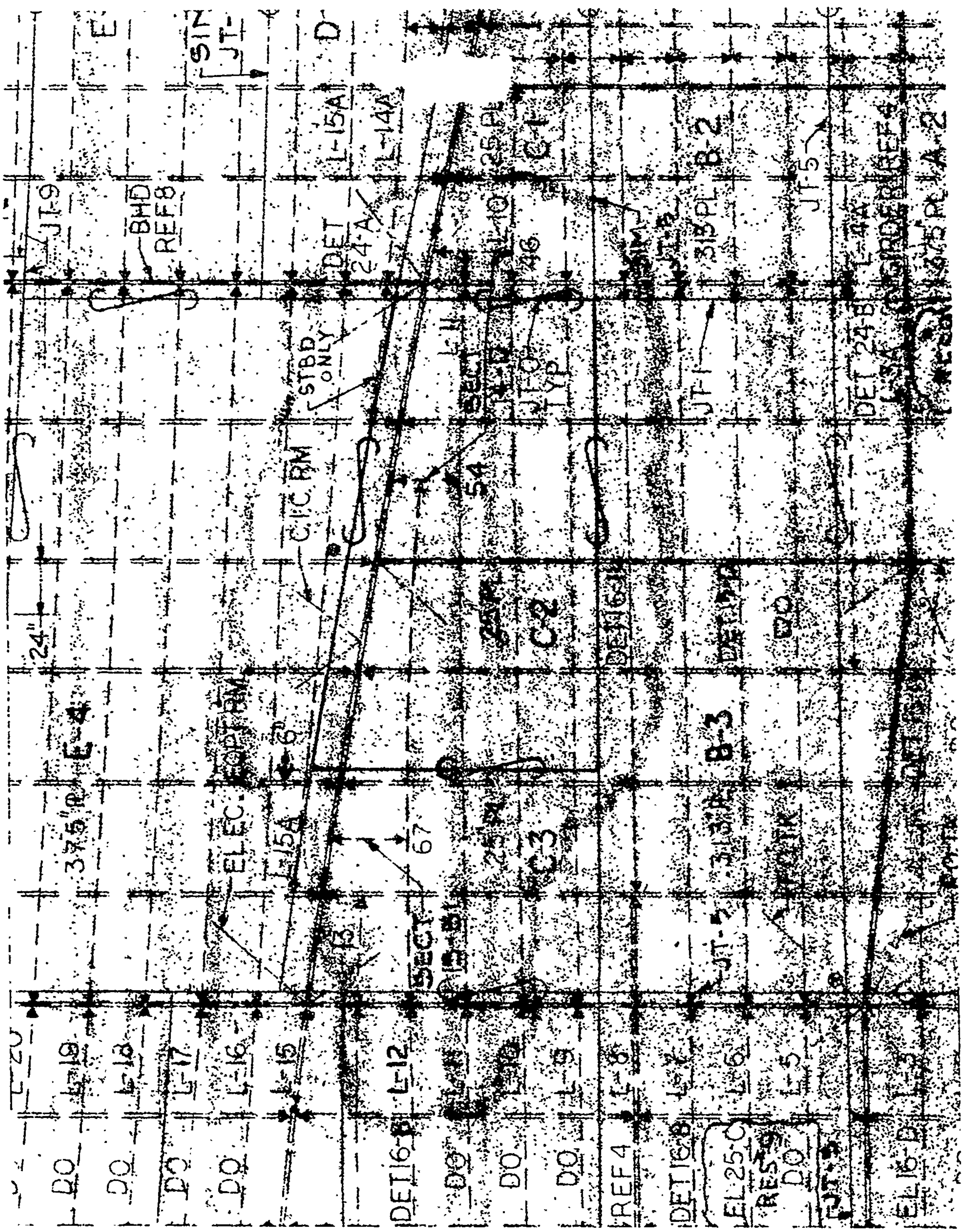
1ST. END-CUT REFERENCE MARK : 0/ 4/ 0 FT/IN/16 FROM END OF BEAM
1/ 8/11 FT/IN/16 FROM THE OPPOSITE END
2ND. END-CUT IS SQUARE - NO REF. MARK GIVEN

********** OUTPUT OPTIONS **********

OPTION	EXECUTED	STORED	DB.NO. AND REV.
WEB1	YES	YES	6 4102-401- 2
TABL	YES	YES	6102-401- 2

PIECES PRODUCED FROM SHAPES

LINE-REV	PIECE MARK/ DRAWING NO.	QTY/ LOC.	AGT.	MAT'L	LENGTH	SIN	'A'	'B'	'C'	N/C ID	WEB 1 FLANGE 1	WEB 2 FLANGE 2	OTHER N/C	AIDS
56- 8	777L100470 S 777	1 16-F	53	8S 904	26-04-04		25-08-04	4	4	6032-404- 2M	F4032-404- 2 7032-404- 2	A5032-404- 2 9032-404- 2	0 LONG.FR.	0 FR.47
57- 6	777L110460 P 777	1 16-B	2	8S 904	1-00-08		- 4-08	4	4	6033-405- 1	F4033-405- 1 7033-405- 1	A5033-405- 1 9033-405- 1	0 LONG.FR.	0 FR.46
58- 7	777L110460 S 777	1 16-F	2	8S 904	1-00-08		- 4-08	4	4	6033-405- 1M	F4033-405- 1 7033-405- 1	A5033-405- 1 9033-405- 1	0 LONG.FR.	0 FR.46
59- 7	777L110470 P 777	1 16-B	53	8S 904	26-04-08		25-08-08	4	4	6032-405- 2	F4032-405- 2 7032-405- 2	A5032-405- 2 9032-405- 2	0 LONG.FR.	0 FR.47
60- 8	777L110470 S 777	1 16-B	53	8S 904	26-04-08		25-08-08	4	4	6032-405- 2M	F4032-405- 2 7032-405- 2	A5032-405- 2 9032-405- 2	0 LONG.FR.	0 FR.47
61- 5	777L120540 P 777	1 16-F	39	8S 904	19-03-14		18-07-14	4	4	6032-406- 1	F4032-406- 1 7032-406- 1	A5032-406- 1 9032-406- 1	0 LONG.FR.	0 FR.54
62- 7	777L120540 S 777	1 16-F	39	8S 904	19-03-14		18-07-14	4	4	6032-406- 1M	F4032-406- 1 7032-406- 1	A5032-406- 1 9032-406- 1	0 LONG.FR.	0 FR.54
63- 5	777L130690 P 777	1 15-B	6	8S 903	4-02-05		3-06-05	4	4	6040-401- 3	F4040-401- 3 7040-401- 3	A5040-401- 3 9040-401- 3	0 LONG.FR.	0 FR.69
64- 7	777L130690 S 777	1 15-B	6	8S 903	4-02-05		3-06-05	4	4	6040-401- 3M	F4040-401- 3 7040-401- 3	A5040-401- 3 9040-401- 3	0 LONG.FR.	0 FR.69
65- 11	782 20120 C 782	1 4-A	20	8F5-00 X -12	4-06-08					0			0	0
66- 11	782 70520 P 782	1 3-F	22	8F5-00 X -12	5-06-04					0			0 FC.FLT.FR.51	0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BHD
REF8
STBD
ONLY
C-IC RM
ELEC.
24"
E-4
C2
C3
B-3
B-2
L-15A
L-14A
DET
24-A
L-12
L-15
L-16
L-17
L-19
DO
REF 4

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RMKS  JESSE  5-6-78                                                       7580200006
MODL    1                                                                 7580200012
DRWG    777   5-6                                                         7580200016
BUTT                        J FWD      F 47.          6 0                 7580200120
                            J AF1      F 73.        - 6 0                 7580200124
                            J AF2      F 65.        - 6 0                 7580200128
LWSM                        J A                                           7580200132
UPSM                        J D1                                          7580200136
PART      777-A3 S      N         1                                       7580200140
SEAM            TRGL      J FWD      J A        J AF1      J B            7580200144
REFL BUTK                    2 0 0                                        7580200148
PSTK                                                 2 0                 7580200152
MARK EXCL                   F 54.      F 67.                             7580200154
PLTE                      81    .375                                      7580200156
PART      777-B3 S      N         2                                       7580200160
SEAM            TRGL      J FWD      J B        J AF1      J C            7580200164
REFL BUTK                    6 0 0                                        7580200168
PSTK                                                 2 0                 7580200172
MARK EXCL                   F 54.      F 67.                             7580200174
PLTE                      81    .313                                      7580200176
PART      777-C2 S      N         3                                       7580200180
SEAM            TRGL      J FWD      J C        J AF2      J D1           7580200184
REFL WLNE                    6 0 0                                        7580200188
MARK EXCL                   F 54.                                         7580200190
PLTE                      81      .25                                     7580200192
PART      777-C3 S      N         4                                       7580200200
SEAM            TRGL      J AF2      J C        J AF1      J D1           7580200204
PSTK                                                 2 0                 7580200208
REFL WLNE                    6 0 0                                        7580200212
MARK EXCL                   F 67.                                         7580200214
PLTE                      81      .25                                     7580200216
INPE                                                                      7580209999
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

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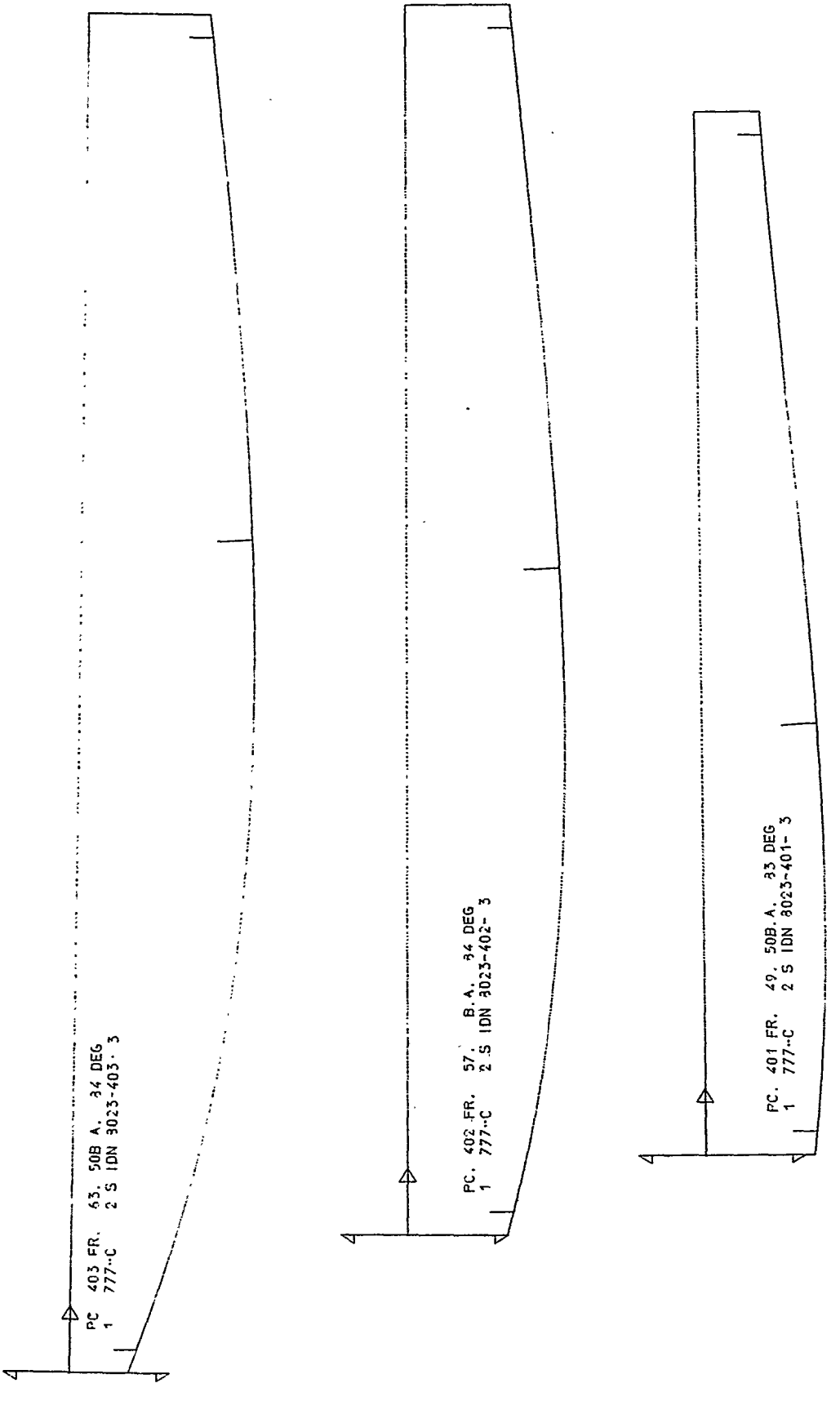
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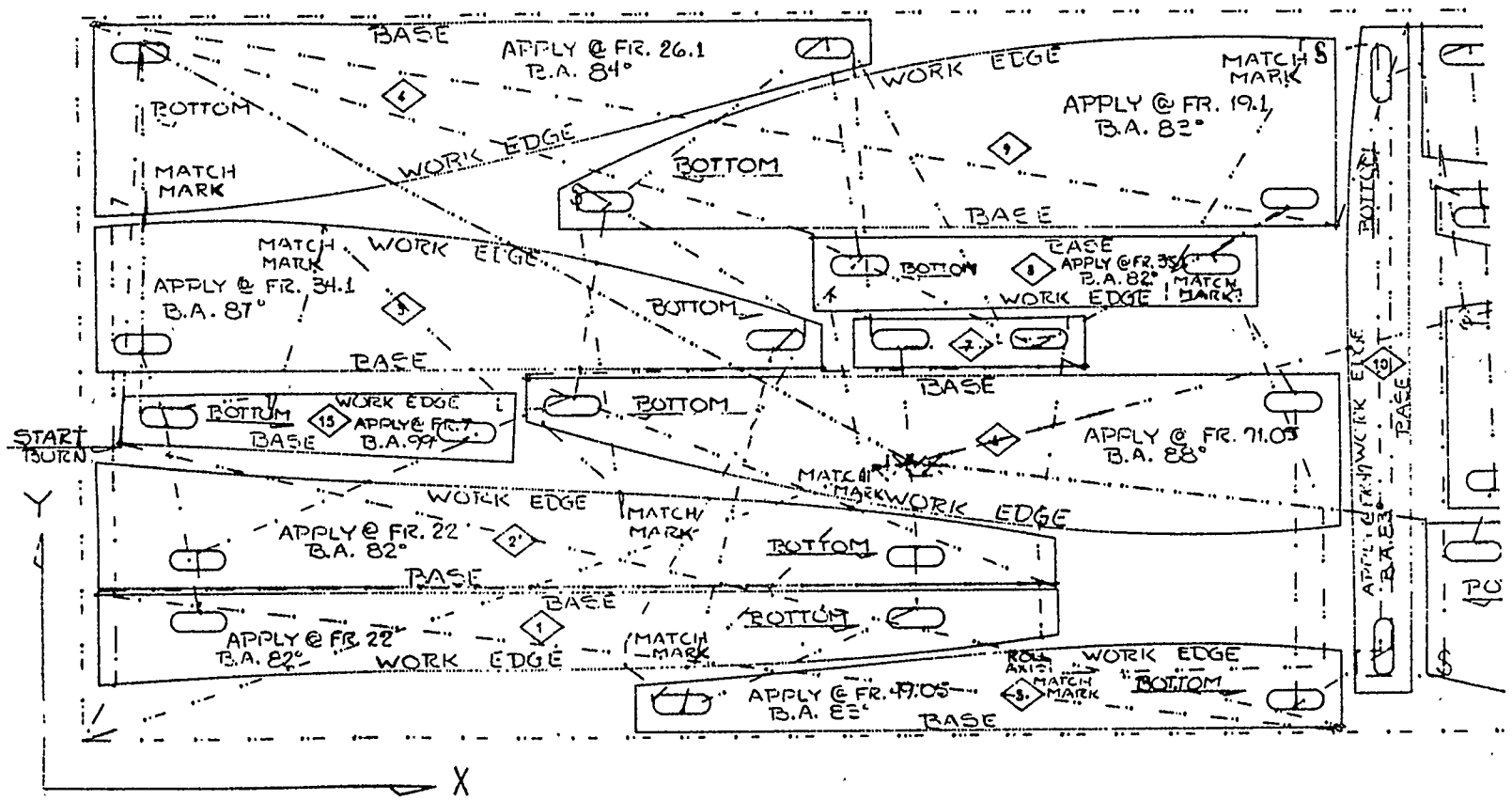
1 777-C 2 S IDN 8023-401- 3



TAPE NO. 741011 - 2

PETERSON BUILDERS INC. 19

PGG 511 CLASS GUNBOAT

NO.PLATES LIKEWISE = 1 NO.PLATES MIRROR IMAGE= 0 TOTAL NO. PLATES = 1

PLATE SIZE = 14400X 4800X 25 STOCK NO.= MIL.= AL. 5456

PART TEMPLATES NESTED THIS TAPE

	PART NO.	QTY.		PART NO.	QTY.		PART NO.	QTY.
1	777-B	1 P 1	1	777-B	1 S 1	1	777-A	2 S 1
1	777-B	2 S 1	1	777-C	2 S 1	1	777-B	3 S 1
1	777-C	1 S 1	1	777-C	1 S 1	1	777-A	1 P 1
1	777-C	1 S 1	1	777-B	2 S 1	1	777-B	2 S 1
1	777-A	1 P 1	1	777-A	1 P 1	1	777-B	1AP 1

REVISIONS

REV	DESCRIPTION	BY	DATE

PREPARED BY

CALI & ASSOCIATES, INC.

CHECKED BY: VALIDATED BY:

JOB NO.7005PB01 NEST TAPE NO. 741011- 2 /

S P A D E S S Y S T E M

DATE 06/12/76

IDENTIFICATION & PLOT LOCATION OF PARTS
FOR TAPE NO. 741011- 2

PLOT REF.	DRWG. & LOC.	N/C ID & MODE	LIKE PLATE MODULE & PCMK.	MIRR. PLATE MODULE & PCMK.
1	777 4-A	8031-403- 3 L	1 777-B 1 P	
2	777 4-A	8041-403- 3 L	1 777-B 1 S	
3	777 4-B	8011-402- 3 L	1 777-A 2 S	
4	777 4-B	8012-401- 3 L	1 777-B 2 S	
5	777 5-B	8023-401- 3 L	1 777-C 2 S	
6	777 5-B	8022-403- 3 L	1 777-B 3 S	
7	777 4-B	8013-401- 3 L	1 777-C 1 S	
8	777 4-B	8013-402- 3 L	1 777-C 1 S	
9	777 9-B	8071-403- 1 L	1 777-A 1 P	
10	777 4-B	8013-403- 3 L	1 777-C 1 S	
11	777 4-B	8012-403- 3 L	1 777-B 2 S	
12	777 4-B	8012-402- 3 L	1 777-B 2 S	
13	777 9-B	8071-401- 1 L	1 777-A 1 P	
14	777 9-B	8071-402- 1 L	1 777-A 1 P	
15	777 9-B	8102-403- 1 L	1 777-B 1AP	

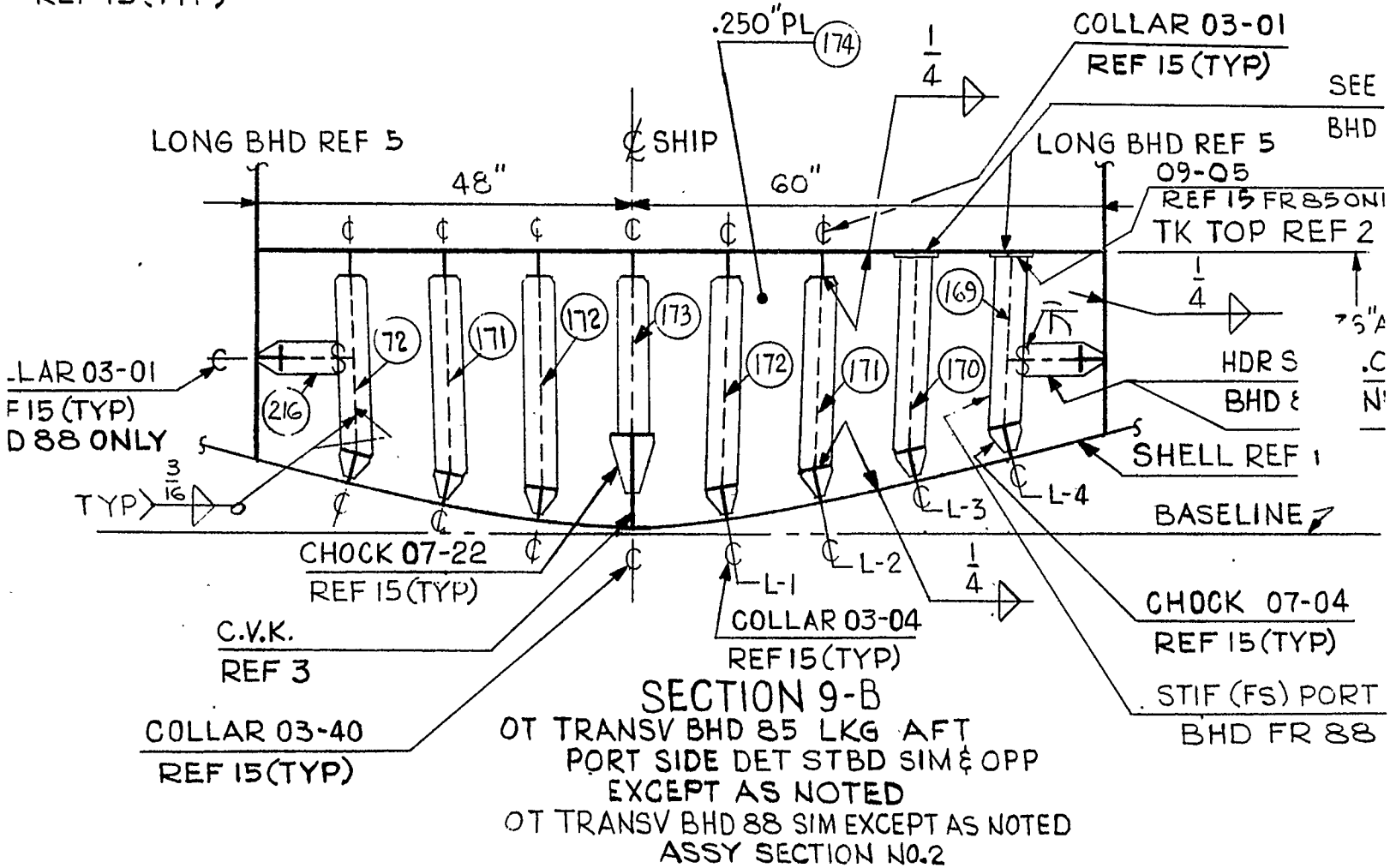
*****

PIECES PRODUCED THROUGH N/C CUTTING

LINE-REV	PIECE MARK	DRAWING NO.	LOC.	QTY.	WGT.	MAT.	THK.	STK	N/C ID.	NEST TAPES	TEMPLATES	PROCESS 1ST 2ND	DESCRIPTION
21- 13	777-C 2 S	777	5-B	1	257	6	.25		8023-300- 2	10045- 3	8023-401- 3 8023-402- 3 8023-403- 3		HSELLPLTG FR.47
22- 13	777-C 3 P	777	5-B	1	150	8	.25	A	8024-300- 2M	10045- 3	8024-401- 1 8024-402- 1 8024-403- 1		HSELLPLTG FR.65
23- 13	777-C 3 S	777	5-B	1	150	8	.25	A	8024-300- 2	10045- 3	8024-401- 3 8024-402- 3 8024-403- 3		HSELLPLTG FR.65
24- 13	777-FK 1 C	777	5-A	1	173	6	.50		8061-300- 4	10046- 2			FLATKEEL FR.22
25- 13	777-FK .2 C	777	5-A	1	173	8	.50	A	8062-300- 3	10046- 2			FLATKEEL FR.47
26- 12	782 120001 C	782	4-A	1	18	8	.50		0160- 1- 3	0160- 1- 1			BRKT.PLT. FR.12
27- 13	782 520006 P	782	3-E	1	44	8	.44		0163- 1- 3	10038- 3			BKT.PLT.FR.51
28- 13	782 520006 S	782	3-E	1	44	8	.44		0163- 1- 3M	10038- 3			BKT.PLT.FR.51
29- 12	782 570037 P	782	3-C	1	1	8	.75		0164- 1- 1	0164- 1- 1			CHOCK PLT FR.57
30- 13	782 570037 S	782	5-C	1	1	8	.75		0164- 1- 1L		0164- 1- 1		CHOCK PLT FR.57
31- 12	783 231001 P	783	3A	1	1	8	.25		0065- 1- 3	10007- 5			INTC.FR. FR.23.1
32- 12	783 231001 S	783	3A	1	1	8	.25		0065- 1- 3M	10007- 5			INTC.FR. FR.23.1
33- 12	783 231002 P	783	3A	1	5	8	.25		0066- 1- 1	10007- 5			INCL.PCS.2-9
34- 12	783 231002 S	783	3A	1	5	8	.25		0066- 1- 1M	10007- 5			INCL.PCS.2-9

LIST OF TEMPLATES REQUIRED FOR PLATES

LINE	TEMPLATE	REST TAPE	FILEMARKS	
52	8022-403- 1	741011	777-B	3 P
53	8022-403- 3	741011	777-B	3 S
54	8023-401- 1	741011	777-C	2 P
55	8023-401- 3	741011	777-C	2 S
56	8023-402- 1		777-C	2 P
57	8023-402- 3		777-C	2 S
58	8023-403- 1		777-C	2 P
59	8023-403- 3		777-C	2 S
60	8024-401- 1		777-C	3 P
61	8024-401- 3		777-C	3 S
62	8024-402- 1		777-C	3 P
63	8024-402- 3		777-C	3 S
64	8024-403- 1		777-C	3 P
65	8024-403- 3		777-C	3 S
66	8031-401- 3		777-B	1 P
67	8031-402- 3		777-B	1 P
68	8031-403- 3	741011	777-B	1 P



SECTION 9-B

OT TRANSV BHD 85 LKG AFT
PORT SIDE DET STBD SIM & OPP
EXCEPT AS NOTED
OT TRANSV BHD 88 SIM EXCEPT AS NOTED
ASSY SECTION NO.2

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         1         2         3         4         5         6         7         8
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INPUT UPDATING          DATE  05/02/78   TIME  21/05/47      RUN NO.    3
JOB PB01  PROG. PART                INPUT 0052   REV. NO.   2          PAGE   1

INPS                    N     0052                          625          7000520004
WRIT  JRP                                        A  90       1 0          7000520006
DRWG 786     9-R                                                          7000520008
MODL 2.07                                                                 7000520012
IRSV              AFT   F 85000                                           7000520016
MOVE2                       6 0     6 0 0                                 7000520020
ADDP                      DTT       PCRG                  -6 0  1       7000520024
LINE FAST                 P       1                                       7000520028
PART 7860850174 C                                                         7000520032C
OUTP                                                                      7000520036
CNTR DOWN                                                                 7000520040
LBHD              S-      LB4     S                                       7000520044
SHFT                              04          ANY-                        7000520048
                                  04          ANY-                        7000520052
SAVE                                                              1       7000520056
LINK      NEW                                                             7000520060
LBHD              P+      LB5     P                                       7000520064
SHFT                              04          ANY+                        7000520068
                                  04          ANY+                        7000520072
SAVE                                                              2       7000520076
LINK      NEW                                                             7000520080
DECK2                     DTT       SL1     P  PEND    S                  7000520084
LINK      INT                                                     2       7000520088
CALL                                                              1       7000520092
LINK      INT EXTD                                      6 0       3       7000520200
SHEL2                     M         LB4     S  LB5     P                  7000520204
LINK      INT     EXTD                                          6 0  4    7000520208
CALL                                                              2       7000520212
LINK      INT                                                     5       7000520216
DECK              P-      DTT                                             7000520220
CTRE                                                                      7000520224
CUTI                  YY        1                                         7000520226
PTNO                    P      300                                        7000520228
MIDN                      DTT                                             7000520232
RNGE                      SCL     C  SL3     S         4 0               *   7000520236
RATH2                     P        2S        08 A  45                     7000520240
STDL                            3 0                                       7000520244
MIDN                      LB4     S                                       7000520248
CCUT                      SL2     S        4 0 A*                  *4     7000520252
CCUT                      SL2     S            A*                  1011   7000520256
RNGE                      DTT     S  PCRG    S         4 0               *4     7000520260
RATH2                   P        3S          08 A -45                      7000520264
MIDN                      M                                               7000520268
RNGE                      SL3     S  SL4B    P         4 0               *5     7000520272
RATH2                   P        4S          08 A  45                      7000520276
MIDN                      LB5     P                                       7000520280
PTNO                    P      510                                        7000520284
CCUT                      SL2     P        4 0 A*                  *3     7000520288
                          SL2     P            A*                  1213   7000520292
RATH2                   P        5S          08 A -45                      7000520400
MIDN                      DTT                                             7000520404
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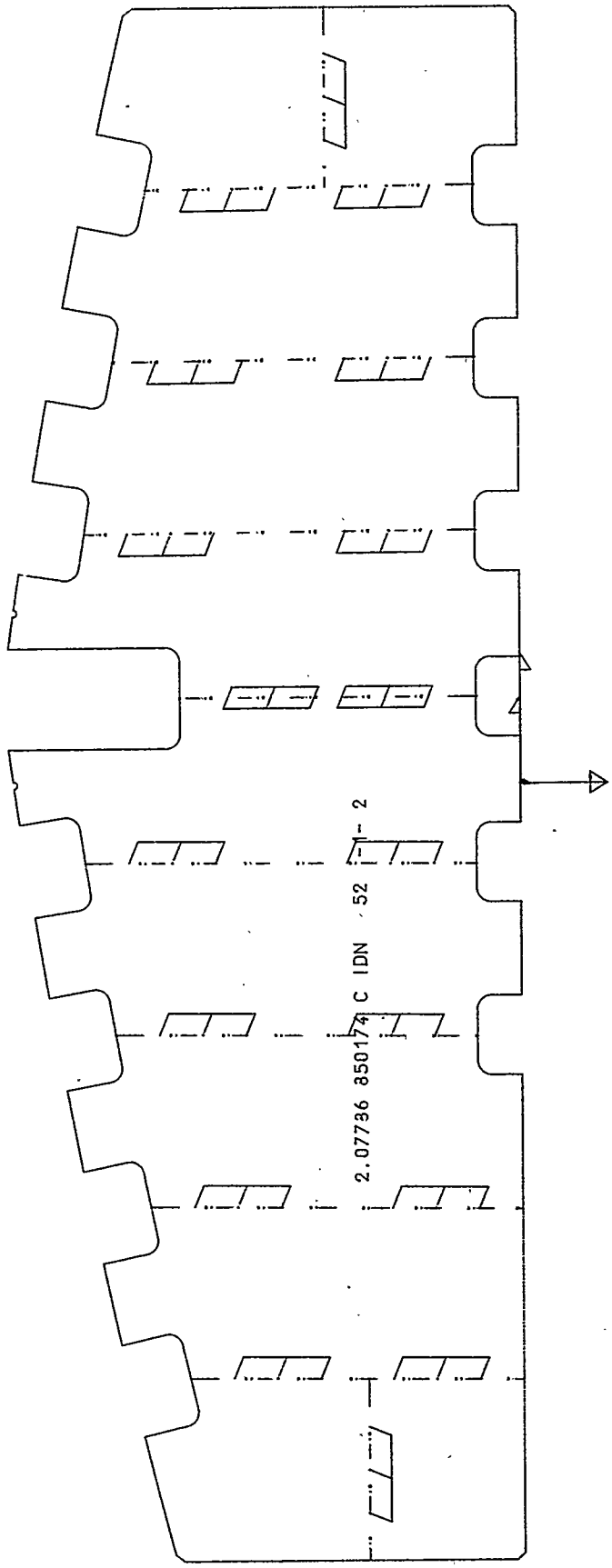
PART GEOMETRICAL DATA FOR NESTING REFERENCE DATE 05/02/78 TIME 21/06/02
JOB 7005P801 SHIP PRG1 PART NO. 52 - 1 - 2 PAGE 1
MODL-PCMK 2.07786 850174 C DWG-LOC 786 9-8 REMARKS
MATERIAL CODE 8 THICKNESS 0.250

DIMENSIONS IN DECF
SHRINKAGE FACTORS USED: X = 1.000000 Y = 1.001040
STARTING POINT OF PART X = 3.000 Y = -0.500

*****PIECE NESTED ON TAPE NUMBER(S) 10039

SEG. NO.	STARTING POINT X	Y	TYPE	VEL	KERF	MOVEMENT DX	WITH DY	CENTER LOCATION DXC	DYC	RUT
1	0.0	0.0	CLT	CT	R	0.0	0.271			
2	0.0	0.271	CLT	CT	R	-0.172	0.0			
3	-0.172	0.271	CLT	CT	R	-0.083	0.083	0.0	0.083	-
4	-0.255	0.355	CLT	CT	R	0.0	0.146			
5	-0.255	0.501	CLT	CT	R	0.0	0.146			
6	-0.255	0.647	CLT	CT	R	0.083	0.083	0.083	0.0	-
7	-0.172	0.730	CLT	CT	R	0.172	-0.000			
8	0.0	0.730	CLT	CT	R	0.0	0.496			
9	0.0	1.226	CLT	CT	R	-0.172	0.000			
10	-0.172	1.226	CLT	CT	R	-0.083	0.083	0.000	0.083	-
11	-0.255	1.310	CLT	CT	R	0.0	0.154			
12	-0.255	1.464	CLT	CT	R	0.0	0.138			
13	-0.255	1.602	CLT	CT	R	0.083	0.083	0.083	0.0	-
14	-0.172	1.685	CLT	CT	R	0.172	-0.000			
15	0.0	1.685	CLT	CT	R	0.0	0.539			
16	0.0	2.224	CLT	CT	R	-0.172	0.0			
17	-0.172	2.224	CLT	CT	R	-0.083	0.083	0.000	0.083	-
18	-0.255	2.308	CLT	CT	R	0.0	0.154			
19	-0.255	2.462	CLT	CT	R	0.0	0.138			
20	-0.255	2.600	CLT	CT	R	0.083	0.083	0.083	0.0	-
21	-0.172	2.683	CLT	CT	R	0.172	-0.000			
22	0.0	2.683	CLT	CT	R	0.0	0.539			
23	0.0	3.222	CLT	CT	R	-0.172	0.0			
24	-0.172	3.222	CLT	CT	R	-0.083	0.083	0.000	0.083	-
25	-0.255	3.306	CLT	CT	R	0.0	0.154			
26	-0.255	3.460	CLT	CT	R	0.0	0.138			
27	-0.255	3.598	CLT	CT	R	0.083	0.083	0.083	0.0	-
28	-0.172	3.681	CLT	CT	R	0.172	-0.000			
29	0.0	3.681	CLT	CT	R	0.0	0.761			
30	0.0	4.442	CLT	CT	R	-0.042	0.042			
31	-0.042	4.484	CLT	CT	R	-2.165	0.000			
32	-2.206	4.484	CLT	CT	R	-0.051	-0.041			
33	-2.258	4.443	CLT	CT	R	-0.069	-0.292	36.417	-8.692	+
34	-2.324	4.151	CLT	CT	R	-0.086	-0.390	40.820	-9.226	+
35	-2.412	3.761	CLT	CT	R	0.249	-0.052			
36	-2.163	3.709	CLT	CT	R	0.065	-0.099	-0.017	-0.082	-
37	-2.099	3.610	CLT	CT	R	-0.037	-0.176			
38	-2.136	3.434	CLT	CT	R	-0.040	-0.191			
39	-2.176	3.243	CLT	CT	R	-0.099	-0.065	-0.082	0.017	-
40	-2.274	3.178	CLT	CT	R	-0.249	0.052			
41	-2.523	3.231	CLT	CT	R	-0.092	-0.470	41.017	-8.306	+
42	-2.615	2.760	CLT	CT	R	0.250	-0.046			
43	-2.365	2.714	CLT	CT	R	0.067	-0.097	-0.015	-0.082	-
44	-2.298	2.617	CLT	CT	R	-0.032	-0.177			


2.07736 850174 C IDN 52 - 2

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INPUT UPDATING          DATE  05/17/78     TIME  08/52/41      RUN NO.    5
JOB PB01  PROG. PART  SPAC        INPUT 0053     REV. NO.    4          PAGE   1

INPS                    R     0053                                     7000530004
RMKS  JRP                                                              7000530008
DRNG 786      9-8                                                      7000530012
MODL 2.07                                                              7000530016
IRSV              AFI    F 85000                                       7000530020
ADDP                     OTT        SCL     C       - 3 0        20    7000530021
DBTP 7861730850 C        R          SLVR    C A*                       7000530024
           SWCTSGCT             S       1 8 R      904                 7000530028
                        P        20                                    7000530032
                                                                1      7000530036C
DBTP 7861720850 S        R          SL1     S A*                       7000530040
                                S       1 8 R      904                 7000530044
                         OTT        SL1     S A*                       7000530048
                                S       1 8                     2      7000530052
DBTP 7861710850 S        R          SL2       A*                       7000530056
                                S       1 8 R      904                 7000530060
                         OTT        SL2       A*                       7000530064
                                S       1 8                     3      7000530068
DBTP 7860720850 S        R          SL3       A*                       7000530072
                                S       1 8 R      904                 7000530076
                         OTT        SL3       A*                       7000530080
                                S       1 8                     4      7000530084
CNTR      CALC                                                         7000530260
DECK              P+     OTT                                           7000530270
CIRE                                                                   7000530280
MION                     OTT                                           7000530290
STOL                           08                                      7000530300
CCUT                     SL3    F       4 0 A*                   53    7000530310
CCUT                     S L3   F           A*                   50    7000530320
                         SL4A   F       4 0 A*                   54    7000530330
                         SL4A   F           A*                   51    7000530340
CUTE                                                                   7000530350
CNTR      CALC                                                         7000530360
SHEL              P+     R                                             7000530370
CIRE                                                                   7000530380
MION                     R                                             7000530390
DBCT                     SL3    F       4 0                      43    7000530400
                         SL3    F                                40    7000530410
                         SL4B   F       4 0                      44    7000530420
                         SL4B   F                                41    7000530430
CUTE                                                                   7000530440C
IMPL 7861700850 P       P       43                                     7000530450
     904                P       40                                     7000530460
                                S       1 8 ASL3     P  R              7000530470
                        P       53                                     7000530480
                        P       50                                     7000530490
          STORTAPE              S       1 8 ASL3     P  OTT      7     7000530500
IMPL 7861690850 P       P       44                                     7000530510
     904                P       41                                     7000530520
                                S       1 8 ASL4B    P  R              7000530530
                        P       54                                     7000530540
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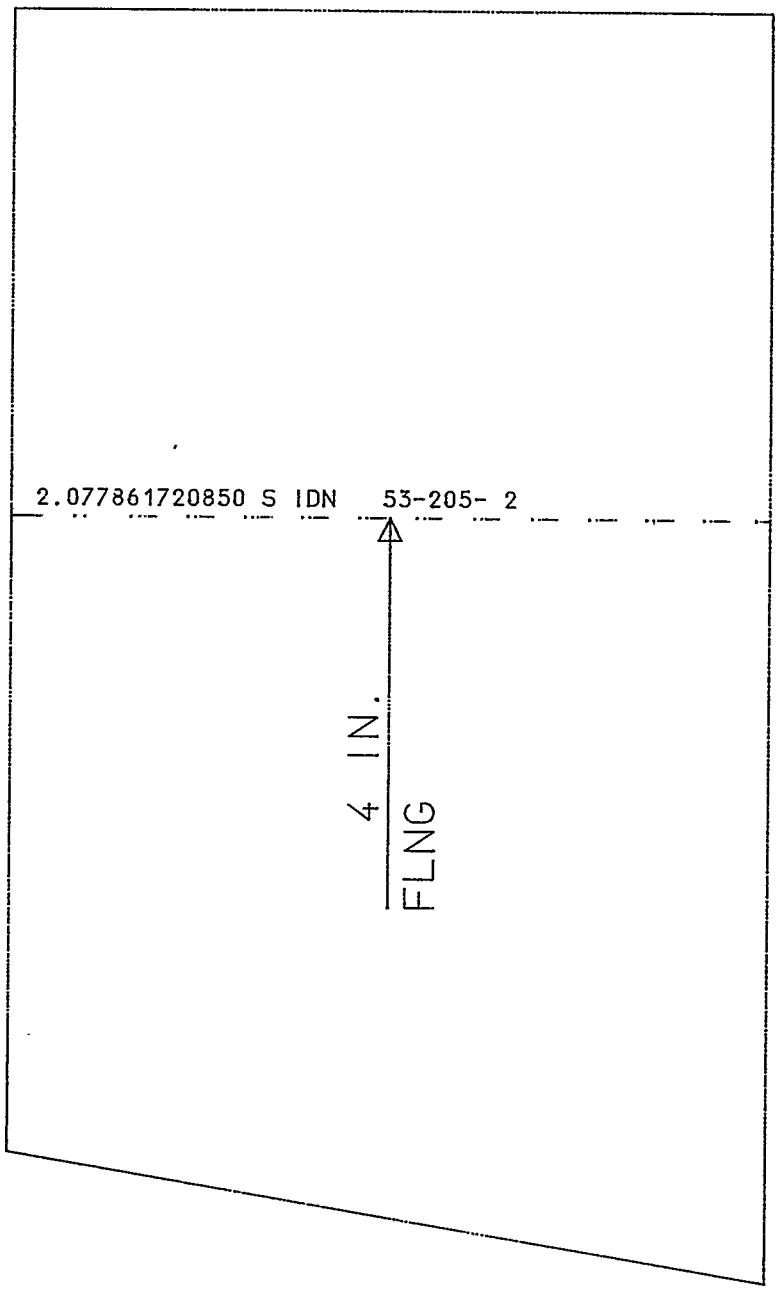
TAPE NO. 780053-204- 2



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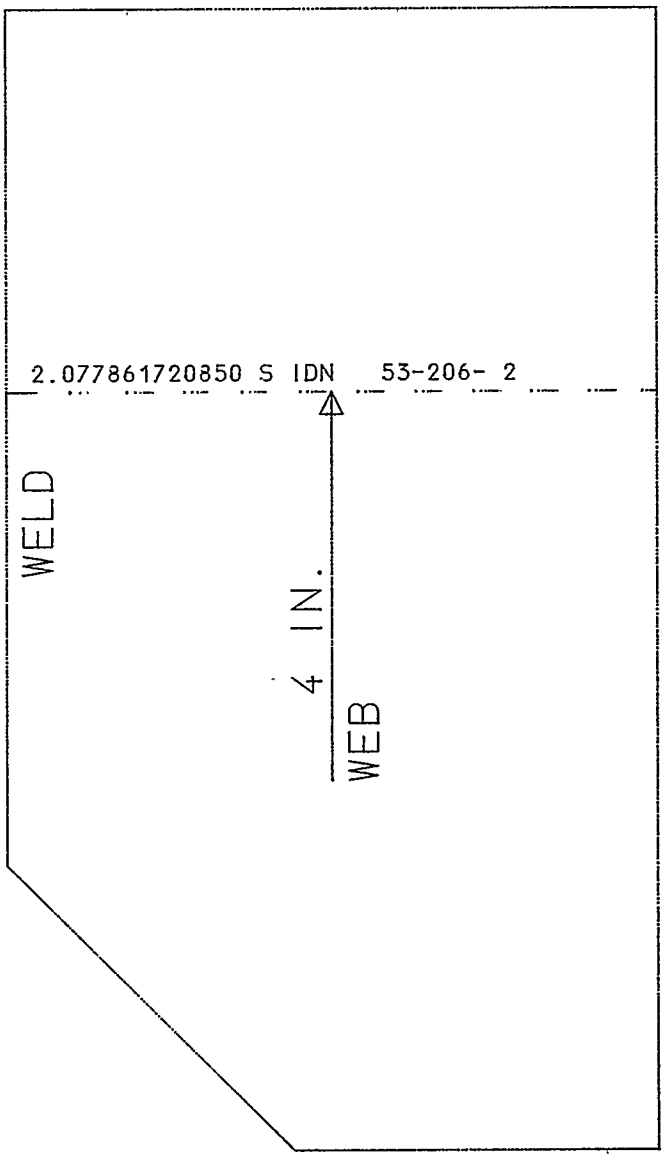

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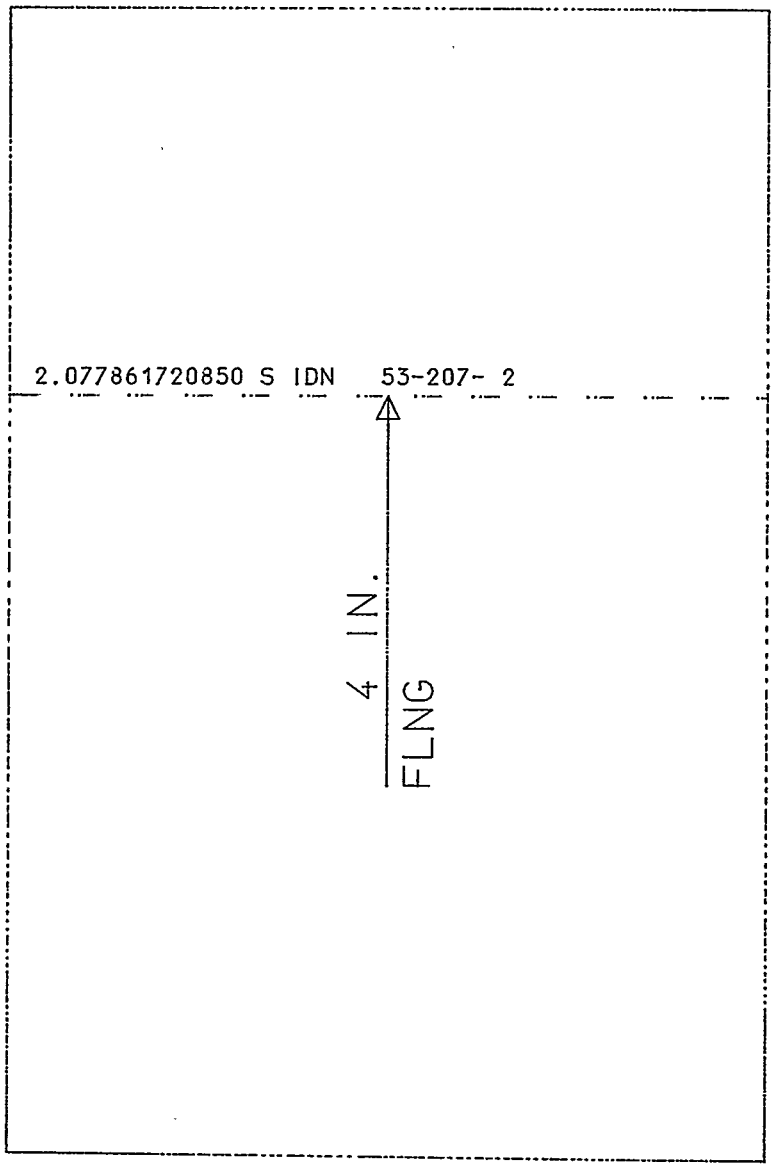

TAPE NO. 780053-207- 2

PIECES PRODUCED FROM SHAPES

LINE-REV	PIECE MARK/ DRAWING NO.	QTY/ LOC.	WGT.	MAT'L	LENGTH	STK	'A'	'B'	'C'	N/C	ID	WEB 1 FLANGE 1	WEB 2 FLANGE 2	OTHER N/C AIDS
12- 5	7861700850 P 786	1 9-B	4	8S 904	2-01-12		1-05-12	4	4	0		B0053-216- 4 0053-217- 4	T0053-218- 4 0053-219- 4	0 BHD.STIFF. FR.85
13- 6	7861710850 P 786	1 9-B	4	8S 904	2-01-06		1-05-06	4	4	0	L	B0053-208- 2 0053-209- 2	T0053-210- 2 0053-211- 2	0 BHD.STIFF. FR.85
14- 5	7861710850 S 786	1 9-B	4	8S 904	2-01-06		1-05-06	4	4	0		B0053-206- 2 0053-209- 2	T0053-210- 2 0053-211- 2	0 BHD.STIFF. FR.85
15- 5	7861719861 P 786	1 9-B	4	8S 904	2-01-11		1-05-11	4	4	0		B0353-208- 1 0353-209- 1	T0353-210- 1 0353-211- 1	0 BHD.STIF.FR.86.1
16- 6	7861710861 S 786	1 9-B	4	8S 904	2-01-11		1-05-11	4	4	0	L	B0353-208- 1 0353-209- 1	T0353-210- 1 0353-211- 1	0 BHD.STIF.FR.86.1
17- 5	7861710880 P 786	1 9-B	4	8S 904	2-01-13		1-05-13	4	4	0000-	0- 1M	B0354-208- 1 0354-209- 1	T0354-210- 1 0354-211- 1	0 BHD.STIFF. FR.86
18- 5	7861710880 S 786	1 9-B	4	8S 904	2-01-13		1-05-13	4	4	0		B0354-208- 1 0354-209- 1	T0354-210- 1 0354-211- 1	0 BHD.STIFF. FR.86
19- 6	7861720850 P 786	1 9-B	5	8S 904	2-03-06		1-07-06	4	4	0	L	B0053-204- 2 0053-205- 2	T0053-206- 2 0053-207- 2	0 BHD.STIFF. FR.85
20- 5	7861720850 S 786	1 9-B	5	8S 904	2-03-06		1-07-06	4	4	0		B0053-204- 2 0053-205- 2	T0053-206- 2 0053-207- 2	0 BHD.STIFF. FR.85
21- 5	7861720861 P 786	1 9-B	5	8S 904	2-03-10		1-07-10	4	4	0		B0353-204- 1 0353-205- 1	T0353-206- 1 0353-207- 1	0 BHD.STIF.FR.86.1
22- 6	7861720861 S 786	1 9-B	5	8S 904	2-03-10		1-07-10	4	4	0	L	B0353-204- 1 0353-205- 1	T0353-206- 1 0353-207- 1	0 BHD.STIF.FR.86.1

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INPUT UPDATING          DATE  05/29/78     TIME  08/59/54      RUN NO.    4
JOB P801  PROG. NEST                 INPUT 0039    REV. NO.   3          PAGE   1

INPS STORTAPEUECF2-AX N       39                                              7100390104
PSPR ESIIPLSMEVEN     PN        1KN       1                                   7100390108
RMKS O.N.                                                                     7100390112
PLTE                  8H        4                 22.5   1  84.        1     7100390116
PIEC ABSL                 0130   1          4          6                      7100390120
                            .1          .05  A  90.                         7100390124
    2                     0350   1          3         30                     7100390128
    2                     0130   1                     2                     7100390132
    2                        .14                 A -90.                     7100390136
    2                     0351   1          2        106                     7100390140
    2                     0350   1                    99                     7100390144
    2                        .17                 A -90.                     7100390148
PIEC ABSL                 0375   2          2          2          5           7100390152
     1521130005 P2.08       20.49        .35       20.49       2.25         7100390156C
REPT ABSL             N   0375  99                    5          2           7100390160
     1521130005 S2.08       20.45       2.4        22.4        2.4          7100390164
PIEC ABSL                 0376   2          1          5          2           7100390168
     1521210005 P2.06       22.42        .2        22.42       2.16         7100390172
REPT ABSL             N   0376  88                    2          5           7100390176
     1521210005 S2.06       20.47        .05       22.4        .05          7100390160
PIEC ABSL                 0130   2          2          2                      7100390184
                             2.4         5.3  A 180.                         7100390185
PIEC2                     0052   1          2         31                     7100390188
    2                     0130   2                    3                     7100390192
    2                        .1          .199 A  90.                        7100390196
OPTN DIST             H                                                       7100390200
DIST                      0130   1          5          6                      7100390204
MARK CKPT                   16.         1.5                                   7100390208C
AUTO                                                                          7100390212
OUTC CKPT                                                                     7100390216
BURN TCUP      RVRS       0375   2      1   2        .04        .02          7100390220
               RVRS       0351   1     30  31        .04        .02          7100390226
               RVRS       0376   2      3   4        .04        .02          7100390232
                          0375  99      4   3        .04        .02          7100390236
                          0376  88      2   1        .04        .02          7100390240
                          0350   1     99  98        .04        .02          7100390244
               RVRS       0130   1      1   2        .04        .02          7100390248
                          0130   2      6   5        .04        .02          7100390252
               RVRS       0052   1     30  31        .04        .02          7100390256
INPE CKPT                                                                     7100399999
         1         2         3         4         5         6         7         8
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                SEVERITY = 0     INPUT IS STORED WITH REV. =   4

                                 INPUT IS EXECUTABLE
```

PETERSON BUILDERS INC.

PGG 511 CLASS GUNBOAT

NO.PLATES LIKEWISE = 1 NO.PLATES MIRROR IMAGE= 0 TOTAL NO. PLATES = 1

PLATE SIZE = 27000X 8400X 25 STOCK NO.= MTL.= AL. 5086

PARTS NESTED THIS TAPE

PART NO.	QTY.	PART NO.	QTY.	PART NO.	QTY.
2.077861010189 S	1	2.07786 861174 C	1	2.07786 880174 C	1
2.081521130005 P	1	2.081521130005 S	1	2.081521210005 P	1
2.081521210005 S	1	2.077861010177 P	1	2.07786 850174 C	1

REVISIONS

REV	DESCRIPTION	BY	DATE

PREPARED BY

CALI & ASSOCIATES, INC.

CHECKED BY: VALIDATED BY:

JOB NO.7005P801 NEST TAPE NO. 710039- 2 /

S P A D E S S Y S T E M DATE 05/29/78

IDENTIFICATION & PLOT LOCATION OF PARTS
FOR TAPE NO. 710039- 2

PLOT REF.	DRWG. & LOC.	N/C ID & MODE	LIKE PLATE MODULE & PCMK.	MIRR. PLATE MODULE & PCMK.
1	786	0130- 1- 4 L	2.077861010189 S	
2	786 9-A	0350- 1- 3 L	2.07786 861174 C	
3	786 9-B	0351- 1- 2 L	2.07786 880174 C	
4	152 7A	0375- 2- 2 L	2.081521130005 P	
5		M	2.081521130005 S	
6	152 9A	0376- 2- 1 L	2.081521210005 P	
7		M	2.081521210005 S	
8	786	0130- 2- 2 L	2.077861010177 P	
9	786 9-B	0052- 1- 2 L	2.07786 850174 C	

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S P A D E S S Y S T E M DATE 05/29/78

SUMMARY REPORT OF BURNING TAPE NO. 710039 - 2

PIERCING TIME	0.9	(PIERCING ALLOWANCE 0.1/ 0.1 MIN.)
RAPID TRAVERSE TIME	7.1	(ASSUMED SPEED 20.00 FT./MIN.)
CENTER PUNCHING TIME	3.2	(ASSUMED SPEED 20.00 FT./MIN.)
BURNING TIME	11.2	(ASSUMED SPEED 12.50 FT./MIN.)
TOTAL PROCESSING TIME	22.4	MINUTES

POST PROCESSOR OPTIONS USED FOR TAPE :

FORMAT : ESI1

CUTTING PROCESS : PLSM

PAPER TAPE PARITY : EVEN

PLATE OUTLINED BY : B.M.

KERF COMPENSATED BY GEOMETRY

MATERIAL UTILIZATION DATA

PLATE UTILIZATION = 53.0 PERCENT

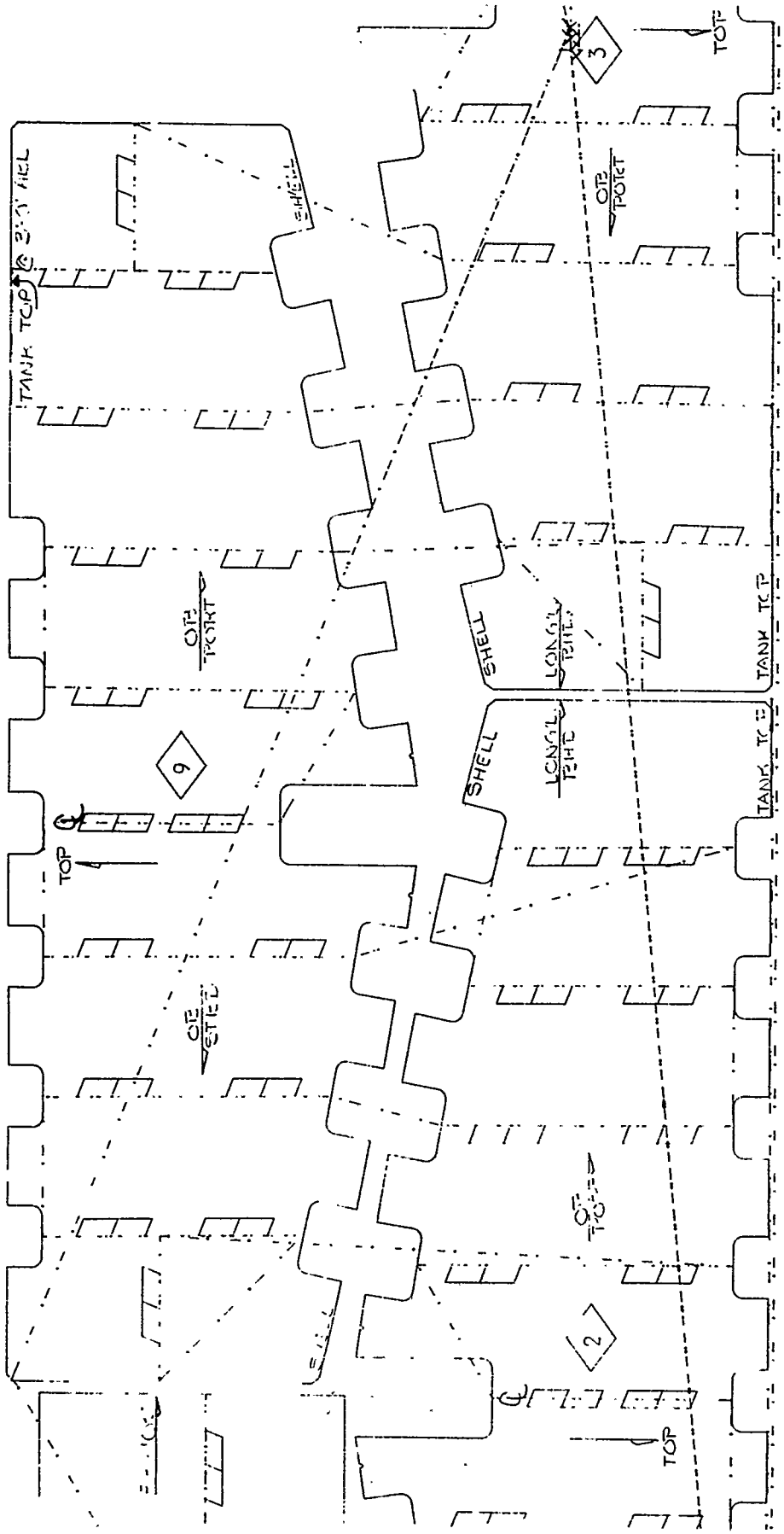
SCRAP WEIGHT = 255.8 POUNDS

TYPE OF MATERIAL AL. 5086

NO ERRORS DETECTED IN THIS RUN

PAPER TAPE IMAGE HAS BEEN STORED IN THE DATABASE

PAPER TAPE IMAGE EXISTS IN THE D.B. UNDER REV. 2 - STATUS = 0.


TANK TOP
SHELL
LONGL
TANK TOP
SHELL
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TOP
TOP
TOP
9
3
2

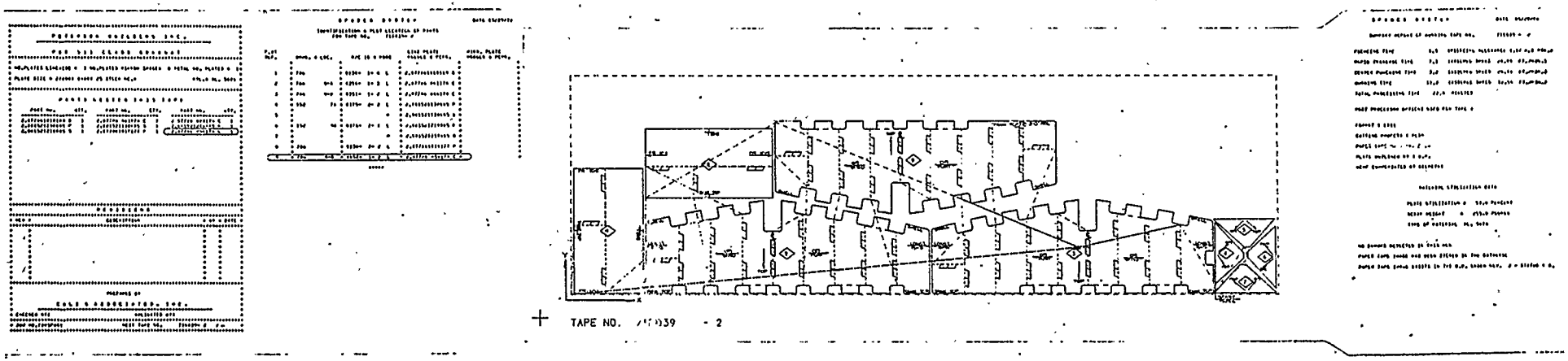
TAPE NO. 039 - 2

PLATE MATERIAL LIST

LINE	STOCK NO.	GRADE	SIZE	QTY.	N/C-TAPE NO.	PRC.TIME	LOC.	NOTES:
1		AL. 5086	27000X 8400X 25	1	710039- 2	22.4		
2		AL. 5086	28600X 6000X 25	1	710049- 2	20.7		

TOTAL PLATE WEIGHT 958.6 LBS
TOTAL SCRAP WEIGHT 395.7 LBS

REPORT DATE : 08/14/78 S P A D E S S Y S T E M PAGE NO. 1. 1

D.B.NAME : P801 7005P801 SHIP PRODUCTION AND CONTROL MODULE MODULE/UNIT: 2.07

VESSEL : GUNBOAT (PPG 1) REPORT REV. 6

PIECES PRODUCED THROUGH N/C CUTTING

LINE-REV	PIECE MARK	DRAWING NO.	LOC.	QTY.	WGT.	MAT.	THK.	STK	N/C ID.	NEST TAPES	TEMPLATES	PROCESS 1ST	PROCESS 2ND	DESCRIPTION
1- 4	786 850174 C	786	9-B	1	71	8	.25	0052-	1- 2	10039- 2				BHD.PLTNG.FR.85
2- 4	786 861174 C	786	9-A	1	71	8	.25	0350-	1- 3	10039- 2				BHD.PLTG.FR.86.1
3- 4	786 860174 C	786	9-B	1	72	8	.25	0351-	1- 2	10039- 2				BHD.PLTNG. FR.88
4- 4	7861010177 P	786		0	30	8	.25	0130-	2- 2	10039- 2				
5- 4	7861010189 S	786		0	30	8	.25	0130-	1- 4	10039- 2				
6- 6	7861050146 P	786		0	2	8	.25	0139-	1- 2					
7- 6	7861050178 C	786	10-C	1	172	8	.25	0127-	1- 3	10049- 2				BHD.PLTNG.FR.105